NOAA – National Marine Fisheries Service

WEEK Two
SEPTEMBER 1 – 7

2008 LUTH CRUISE

Studying Leatherback Use of Temperate Habitat Along the Central California Coast

CHIEF SCIENTIST:
Scott Benson

CRUISE LEADER:
Scott Benson

SURVEY COORDINATOR:
Annette Henry

SCIENTISTS (A-Z):
Kristen Cieciel
Heidi Dewar
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Karin Forney
Justin Garver
Dave Griffith
Jim Harvey
Daniel Palacios
Owyn Snodgrass
Kate Swails
Russ Vetter
Elizabeth Zele

VISITORS:
Aaron Guptill

TEACHER AT SEA
Alice Eilers

Weekly Science Summary

Scott Benson (Chief Scientist)

At the start of our second week of LUTH 2008, we found ourselves in a patch of leatherback habitat in Monterey Bay. Our aerial survey team found us a turtle about five miles west of my house in Moss Landing, California, and Jim Harvey (MLML) managed to attach a Time-Depth Recorder (TDR) coupled with a VHF transmitter. These tags are attached from the small boat via a soft suction cup and can remain on the turtle for hours to days. The TDR record revealed that the turtle was using the upper 12 meters of the water column to forage on the abundant *Chrysaora fuscescens* (sea nettle) in the relatively shallow waters adjacent to the Monterey submarine canyon. Following our work in Monterey Bay, we moved offshore again to try one last attempt at tagging a swordfish. Although we found a small pool of relatively warm water (15-16°C), we were not lucky enough to catch a swordfish for tagging. Nevertheless, the effort combined with the previous week's fishing revealed aspects of the type of water properties necessary to find swordfish; warm (17-18 °C), low salinity waters -- typically found more than 60 miles from the coast during late August-early September -- that display a sharp frontal feature between the colder, saltier waters against the coast. Following our last attempt to capture a swordfish, we stopped briefly in Monterey and said goodbye to Heidi, Russ, Owyn, and Aaron. We learned much about swordfish habitat from the fishing team, particularly Aaron Guptill, and benefited from their collective insight.

Weather conditions offshore remained harsh with constant 20-30 knot winds and a 10-15 foot sea, therefore, we decided to stay near the coast and characterize the core leatherback habitat off the San Mateo County coastline. Our aerial team found leatherbacks here during the previous week, and we have documented a great density of leatherbacks in this area during previous years. We have also noted some unusual aspects of these waters, but have never had the opportunity to characterize them with the kind of equipment we have available to us on this survey. Furthermore, a leatherback we tagged in this area during September 2007 returned to the exact location of the tagging event last week after spending the winter in tropical latitudes near Hawaii. This is 'Jelly Lane', and it is the reason that leatherbacks perform a 7,000 mile trans-Pacific migration from their western Pacific nesting beaches in the Solomon Islands and New Guinea. Huge aggregations of sea nettles are temporally predictable here, reaching a peak during September.

Scott Benson measuring a sea nettle

"We've come to know these type of conditions as 'turtle water'. Our net sampling revealed great hauls of huge sea nettles…. It was a jelly jubilee!"

Jellyfish blooms like this one are a defining characteristic of 'turtle water'

Leatherback turtle off Central California

WEEKLY SCIENCE SUMMARY - *CONTINUED*

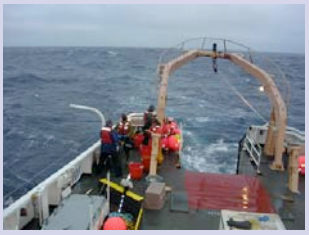
As we zig-zagged north from Point Año Nuevo to the mouth of the San Francisco Bay, the water changed from cold and green to warm and brownish-red in color. We've come to know these type of conditions as 'turtle water'. Our net sampling yielded great hauls of huge sea nettles (bell diameters up-to 55cm). It was a jelly jubilee!

During the following day, our aerial survey team found a half dozen leatherbacks within the shipping lanes to/from San Francisco Bay (essentially playing on the freeway), and two more turtles were tagged with the suction cup VHF/TDR apparatus. We obtained two dive records of 3 and 6 hours duration, respectively, and retrieved the tags with the help of our expert aerial tracking team aboard the NOAA Twin Otter. The skilled steering capabilities of the *Jordan*'s bridge crew and a long dipnet were also essential to our success. Overall, it was a fantastic week and proves the old adage that it life presents you with lemons (in this case, rough weather offshore), make lemonade!

The first leg ended with our arrival in San Francisco on September 6, and we reluctantly said goodbye to Tomo, Daniel, Dave, Kristin, Jim, Kate, and Alex. This was a unique team of individuals, each bringing a special gift or contribution to the survey…the 'dream team' of oceanographers, sampling experts, turtle taggers, and programmers. We will especially miss Alex's enthusiasm and joy of discovery -- we wish her much success in her mission to educate the public about leatherbacks, marine conservation, and the research conducted by NOAA. Particular thanks go to Dave Griffith, who kept us in the game despite the best efforts of the gremlins that sought to cripple our operations. Dave spent many hours troubleshooting our sensitive equipment. We are grateful for his efforts and wish him a much deserved break after multiple months at sea this year.

Scott Benson, Daniel Palacios, and Tomo Eguchi working on the *Jordan*'s Deck

Readying to deploy a CTD during LUTH 2008



Aft deck aboard the *David Starr Jordan* LUTH 2008

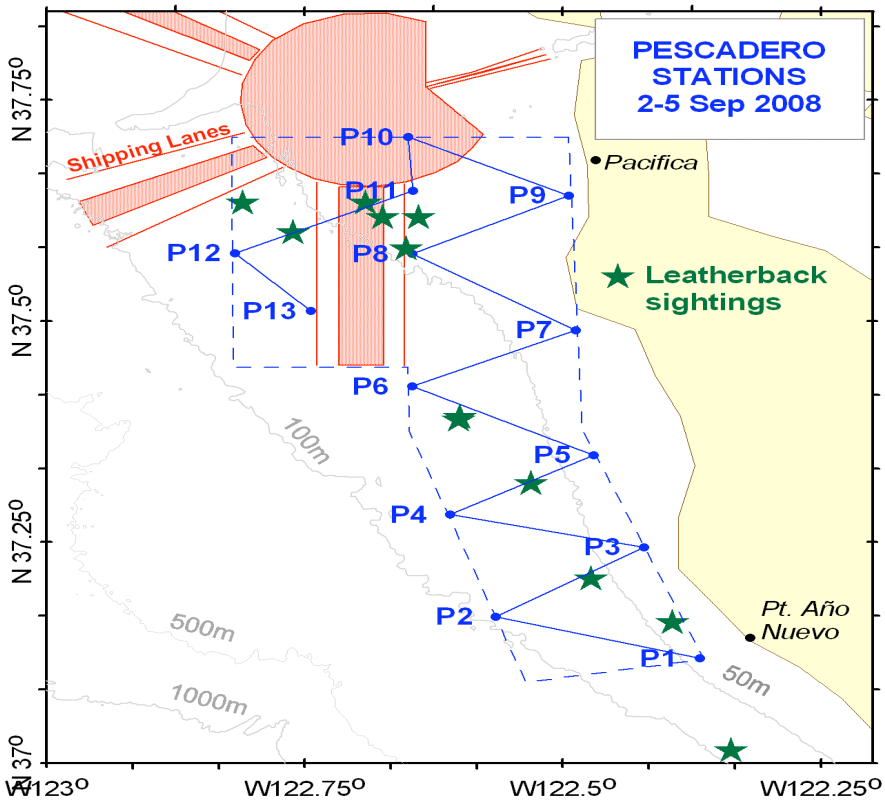


FIG 1. 'Pescadero' sampling grid off the San Mateo County coastline, in the nearshore foraging habitat of leatherback turtles.

Oceanographic Data Collection

Kristen Ciecielski, Tomo Eguchi, Karin Forney, Dave Griffith, Daniel Palacios, and Elizabeth Zele

As we welcomed our new team members Liz Zele and Justin Garver aboard this week, the equipment gremlins continued to wreak havoc with our CTD and all the spare parts we tried this week, despite Dave's best efforts to evict the beasties and get our systems functioning again. Thanks to our ample supply of XBTs and the diligence of everyone on the oceonography team, we were able to compensate by deploying hourly XBTs and collecting frequent water samples for chlorophyll sampling. By the end of the week, Dave and Liz were finally successful in getting the CTD functioning again. (Yeah!).

The highlight of this week was the unexpected opportunity to sample nearshore turtle habitat off the San Mateo County coastline. With the seas still too rough offshore and the aerial team reporting numerous leatherbacks nearshore, we set up a sampling grid between Pt. Año Nuevo and Pacifica, carefully avoiding the shipping lanes as much as possible, Fig. 1. This region has been a reliable foraging area for leatherbacks in past years, with turtle observations centered on or near the 50m isobath -- for unknown reasons. As we criss-crossed this study area, we found abundant, large jellyfish (up to 10.9 kg weight!), and some very interesting physical oceanographic features. In particular, our echosounders consistently recorded internal waves (Fig. 2) in the central depths of our study area, between the 50m and 70m isobath. Hmm... could this be a significant pattern explaining our jelly/turtle distribution?

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The ocean sunfish (*Mola mola*) is a species that is common in areas with 'turtle water'

LUTH Leg 1 Science Team

OCEANOGRAPHIC DATA COLLECTION - *CONTINUED*

Internal waves are set up when there is a sharp density gradient within the water column (e.g. caused by abrupt temperature or salinity changes), combined with a disturbance mechanism, such as tides. It is possible that the internal waves play a role in the establishment and/or maintenance of jellyfish aggregations and leatherback foraging habitat in this area. We look forward to examining these data in more detail at the end of the cruise.

Our other notable observation was a marked spike in AC-S (optical analysis) readings in areas where we saw 'turtle water' -- a type of water we have identified from the air for many years that is characterized by a peculiar, murky brown coloration, jellyfish (esp. sea nettles), and the occurrence of leatherbacks and large ocean sunfish. The AC-S measurements appear to have quantitatively captured the pattern we have recognized subjectively for years during aerial surveys of leatherbacks. It will be interesting to compare these optical properties in the nearshore vs. offshore waters as we move offshore again during the next 2 weeks (weather permitting).

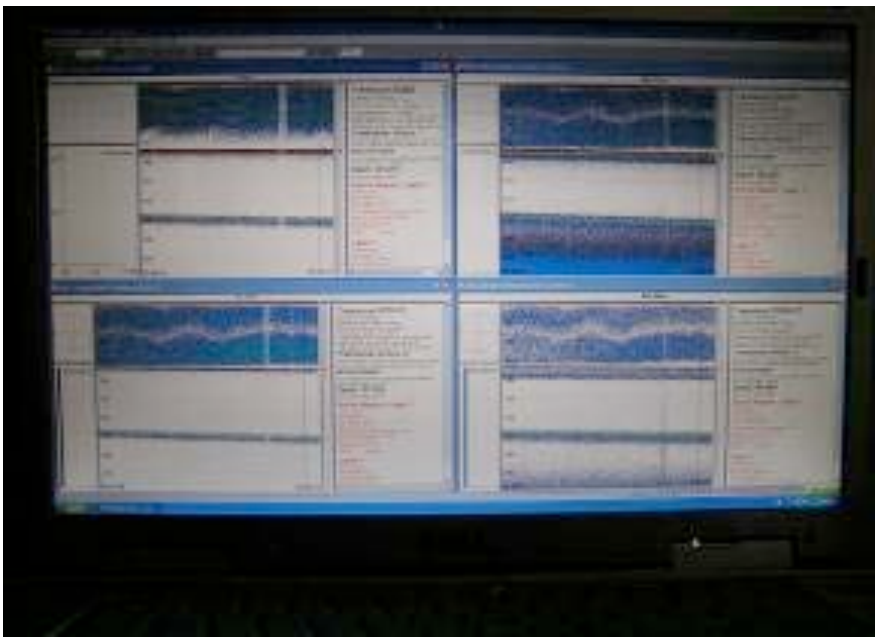


FIG 2. Echosounder display showing the internal waves.

Sea nettle

JELLY-BELLY REPORT

SCOTT BENSON, KRISTEN CIECIEL, TOMO EGUCHI, KARIN FORNEY, JIM HARVEY, AND DANIEL PALACIOS,

Our trawl efforts this week paid off big time, with some huge hauls of jellyfish in our Pescadero sampling grid. The record catch was a 550mm diameter, 10.9kg sea nettle...taller than any of our scientists! Based on the measurements we obtained from the captured jellies, we derived a nice length-weight relationship, and a size frequency distribution indicating that there were two cohorts of sea nettles in the area.

FIG 3. Hauling aboard a trawl net full of jellies during LUTH 2008. Thanks to Jim Harvey and Moss Landing Marine Labs for providing the Trawl Net.

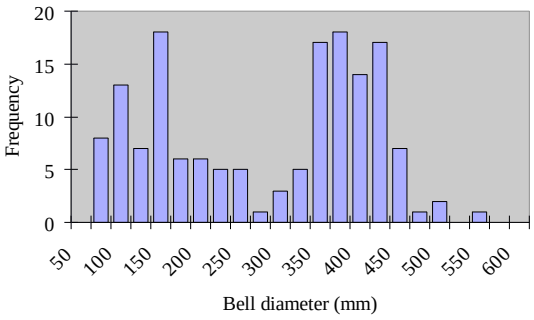


FIG 4. Histogram of bell diameters for sea nettles (*Chrysaora fuscescens*) collected during LUTH 2008 (n = 154).

Moon Jellies
Aurelia aurita

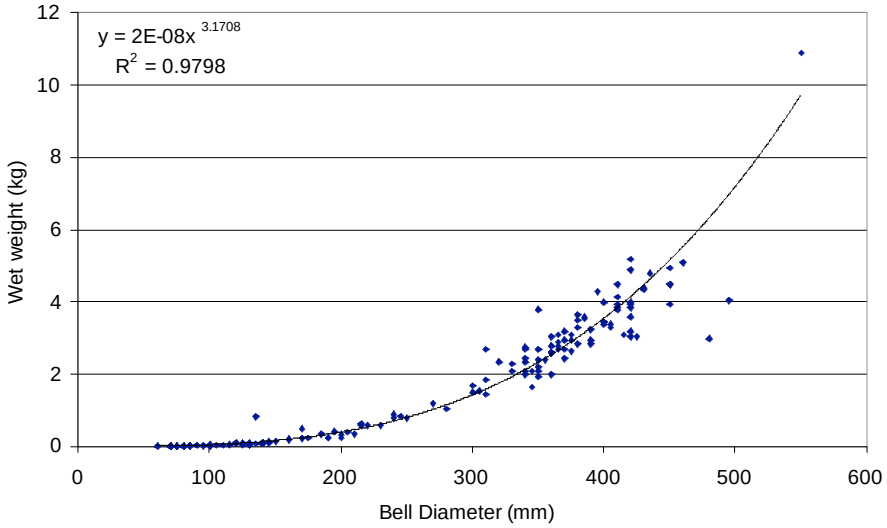


FIG 5. Relationship between Sea nettle (*Chrysaora fuscescens*) bell diameter and wet weight for specimens collected during the LUTH 2008 cruise (n = 154).

AERIAL TEAM COORDINATOR
ERIN LACASELLA

NOAA TWIN OTTER PILOTS:
NICOLE CABANA
JASON MANSOUR

OBSERVERS:
BRIAN HOOVER
KELLY NEWTON
DAN PROSPERI
SUZANNE RODEN
LISA WERTZ
KATHERINE WHITAKER

Baird's Beaked Whales
(*Berardius bairdii*)

A 'Bubble's Eye View'
from the NOAA Twin Otter

AERIAL SURVEYS

ERIN LACASELLA

This week we had a phenomenal weather window that allowed 6 consecutive days of flying, which is very rare to come by in this area. Early in the week while the NOAA Ship *David Starr Jordan* was in Monterey Bay, we were able to complete a fine-scale survey of the entire bay. With sightings of harbor porpoise, groups of sea lions and our first leatherback with the *Jordan* nearby, we successfully lead the *Jordan*'s small boat (*J3*) to deploy the first VHF suction cup tag. In the days to follow we completed a fine-scale survey of the Pescadero area and found two leatherbacks before working our way north with the *Jordan* to fly a fine-scale survey in the Gulf of the Farallones. In this survey we found 6 turtles in our first four transect lines! Surrounded by miles of jellyfish, large ocean sunfish, and humpback whales to name a few, we lead the *Jordan* and *J3* to a turtle to deploy a second VHF suction cup tag. To allow time for data collection and save air time and fuel we landed at the Half Moon Bay airport for a rest. On our way to the airport we spotted another turtle off the stern of the *Jordan*, and the crew aboard successfully deployed a 3rd suction cup tag. After a 4-hour break we put our eyes, ears and antennas to the test and like a needle in a haystack, were successful in locating and guiding the J3 to retrieve the final tag. Friday was our last day of flying for the week and we flew transect lines approximately 60 miles offshore. With calm seas and clear skies we spotted two more leatherbacks, a group of six Baird's beaked whales (*Berardius bairdii*), Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) and a large school of northern right whale dolphins (*Lissodelphis borealis*) – a beautiful day of surveys in conditions we do not see very often. Saturday was a mandatory day off for our pilots, and well deserved. We had a wonderful week of aerial surveys and this will be a tough act to follow.

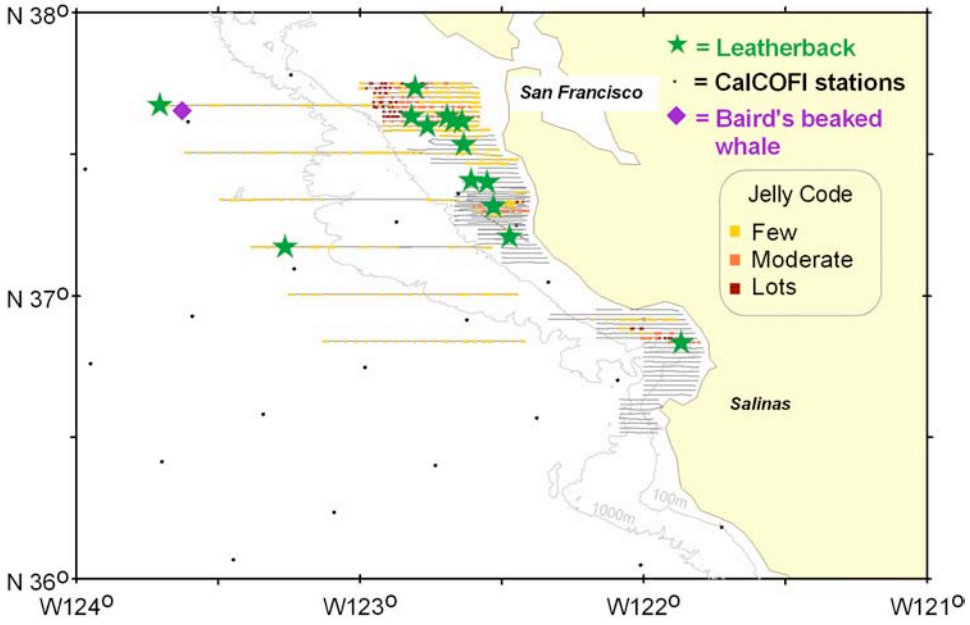


FIG 6. Aerial Survey tracklines completed and notable sightings during LUTH 2008 Week 2.

A WORD FROM OUR TEACHER AT SEA

ALICE 'ALEX' EILERS

The second week has been absolutely fabulous as we found a leatherback – in fact we found three!!! This week has been all about the turtle: from identifying the biotic and abiotic conditions that define leatherback turtle habitat and foraging grounds, to tracking and tagging – we've done it all.

- Abiotic oceanographic data provided by scientific instruments such as XBTs (expendable bathythermographs), CTD (conductivity, temperature and depth), and water samples containing nutrient data to characterize the abiotic foraging habitats of the leatherback turtle.

Teacher at Sea Alex Eilers releasing an XBT (above) and working with the CTD device (right)

- Net tow samples characterized the biotic conditions such as the jellyfish species prevalent in the turtle diet: moon jellies, sea nettles, and egg yolk jellies.

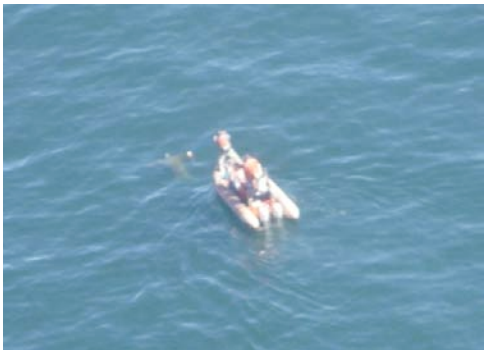
Teacher at Sea Alex Eilers measuring a moon jelly (left). Egg yolk jelly with pipefish and larval rex sole (below)

A WORD FROM OUR TEACHER AT SEA - CONTINUED

- Tracking the turtles via air surveillance and handheld antenna.

The *J3* with VHF tagging ream ready for action

- Tagging the turtles to reveal their foraging and diving behavior.



Leatherback with a VHF Suction cup tag fir studying dive behavior

Attaching a suction cup transmitter to a leatherback turtle. View from the hard-bottomed inflatable (left) and from the NOAA Twin Otter aircraft (right)

A NOTE FROM OUR PERMITS DIVISION PARTICIPANT

KATE SWAILS

I read all about the leatherback sea turtle research that the SWFSC is conducting from my desk at the Office of Protected Resources, Permits Division in Silver Spring, Maryland. So when the opportunity arose to come out and participate in the LUTH cruise I jumped at the chance. The relationship between the Permits Division and researchers is often a tricky one. My experiences these past two weeks have reemphasized the benefit of strong partnerships and communication between researchers in the field and regulators in the office working together towards the common goal of leatherback conservation and recovery.

Thanks for the chance to see fresh air, sunshine, swordfish, and sea turtles.

PS—I'll report back that the SWFSC scientists are superb permittees.